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ABSTRACT

Appendices A - D to the technical report "The Development of a Process Evaluation Instrument" are presented. This instrument was developed as part of the Mathematical Problem Solving Project, MPSP. The appendices are: (1) Interview Problems; (2) First Instrument; (3) Second Instrument; and (4) Student Responses to Second Instrument and Transcripts of Interviews. (MP)

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TECHNICAL REPORT V: PROCESS EVALUATION

APPENDICES A - D

APPENDIX A: Interview Problems

APPENDIX B: First Instrument

APPENDIX C: Second Instrument

APPENDIX D: Student Responses to Second Instrument and Transcripts of Interviews

MATHEMATICAL PROBLEM SOLVING PROJECT

A Project of the
MATHEMATICS EDUCATION DEVELOPMENT CENTER
Project Supported by
National Science Foundation Grant PES74-15045

SE 026 931

TECHNICAL REPORT V: PROCESS EVALUATION

APPENDIX A: Interview Problems

APPENDIX A: Interview Problems

1. On Monday a magic plant is 2 inches high. On Tuesday the plant doubles its height and is 4 inches high. Each day the plant doubles its height from the day before. How high will the plant be on Friday?

2. Lisa has $1.00 to spend at the store. Apples cost 12¢ a piece. Oranges cost 10¢ a piece. How many apples and oranges can Lisa buy?

3. Tom and Judy both work part time in a cafeteria. Tom works one day and then has three days off before he works again. Judy works one day and then has four days off. If Tom works this Monday and Judy works this Tuesday, how many days in two weeks will Tom and Judy work the same day?

4. A caterpillar is put into the bottom of a jar that is 8 inches high and 6 inches across. Every day it crawls up 4 inches. Every night it slips back 2 inches. How many days will it take the caterpillar to reach the top of the jar?

5. What are the ways that 10 pennies can be put into 4 piles so that each pile has a different number of pennies?

6. How many ways can 15 pennies be put into 4 piles so that each pile has a different number of pennies?

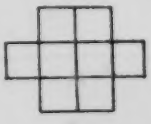
7. As a gold prospector you want to weigh gold but your balance has only 3 weights. What weight would you use to weigh amounts (in whole numbers) of gold from 1 through 7 ounces?

8. Add 4 odd numbers to get 10. (You may use a number more than once!) How many ways can it be done?

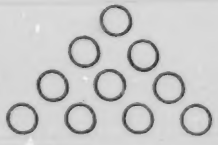
9. Some children are seated at a large round table. They pass around a box of candy containing 25 pieces. Ted takes the first piece. Each child takes one piece of candy as the box is passed around. Ted also gets the last piece of candy, and he may have more than the first and last pieces. How many children could be seated around the table?

10. Joe and Tim are playing a game. At the end of each game, the loser gives the winner a penny. After they have played some games, Joe has won 3 games, and Tim has 3 more pennies than when he began. How many games did they play?

11. Use each number from 1 to 8 once to fill in the small squares so that no two numbers that follow in order (such as 4 and 5) are in squares that touch.



12. Can you move three circles and turn the triangle upside down?



TECHNICAL REPORT V: PROCESS EVALUATION

APPENDIX B: First Instrument

(PROBLEM 1)

NAME _____ Form AY

Problem 1. What are the ways that 10 pennies can be put into 4 piles so that each pile has a different number of pennies?

Answer:

NAME _____ Form AY1

Problem 1 - Questions

CIRCLE "YES" NEXT TO A CORRECT STATEMENT AND "NO" NEXT TO AN INCORRECT STATEMENT.

1. The information the problem gave me that was helpful includes:

YES NO There are 10 pennies.

YES NO Each penny has to go into a pile.

YES NO There must be 5 piles.

YES NO The pennies are new.

YES NO Each pile has to have a different number of pennies.

****

IF YOU DID ANY OF THESE, WRITE "1" NEXT TO THE SENTENCE YOU DID FIRST, "2" NEXT TO THE SENTENCE YOU DID SECOND, AND "3" NEXT TO THE SENTENCE YOU DID THIRD.

_____ I read the problem again.

_____ I drew a picture.

_____ I decided what information I would use to solve the problem.

_____ I thought about the problem.

_____ I thought about other problems like this one.

_____ I wrote on paper.

_____ I did not do anything.

_____ I did something different. Here's what I did:

_____

_____

****

CIRCLE "YES" NEXT TO THE STATEMENTS THAT ARE CLOSE TO WHAT YOU DID OR THOUGHT ABOUT. CIRCLE "NO" NEXT TO THE STATEMENTS THAT ARE NOT CLOSE TO WHAT YOU DID OR THOUGHT ABOUT.

3. When I started working on this problem,

YES NO I started with a pile with five pennies.

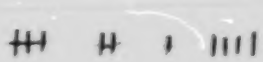
YES NO I started with a pile with one penny.

YES NO I started with a pile as big as my lucky number.

YES NO I started with a pile with _____ pennies.
(put in the number you started with)

4. Here is what some other children wrote down when they did the problem. Which is (are) most like what you did or thought about?

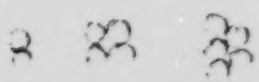
YES NO Ten marks divided into groups



YES NO Some addition problems like

5	1
3	4
1	3
1	2

YES NO Some groups of pennies like



YES NO Some stacks of pennies like

YES NO I did it a different way like this:

5. When I worked this problem,

YES NO I got an answer that had too many piles.

YES NO I found a way to work the problem but it had too many pennies.

YES NO I added wrong.

YES NO I found an answer but with not enough piles.

YES NO I got an answer with enough piles but not enough pennies.

YES NO I got confused.

6. What did you do when you got an answer?

YES NO I checked to be sure the answer was correct.

YES NO I tried to find more answers.

YES NO I read the problem again.

YES NO I stopped working.

YES NO I tried to think of a problem like this one.

YES NO I don't remember.

YES NO I did something different. Here is what I did:

_____

_____

7. What did you know about your answer?

YES NO I knew my answer was correct.

YES NO I thought my answer was correct but I was not sure.

YES NO My answer was probably wrong.

YES NO My answer was wrong for sure.

YES NO There was no way to find the answer.

(PROBLEM 2)

NAME _____ Form AY

Problem 2. On Monday a magic plant is 2 inches high. On Tuesday the plant doubles its height and is 4 inches high. Each day the plant doubles its height from the day before. How high will the plant be on Friday?

Answer:

NAME _____ Form AY2

Problem 2 - Questions

CIRCLE "YES" NEXT TO A CORRECT STATEMENT AND "NO" NEXT TO AN INCORRECT STATEMENT.

1. From reading the problem, I know these things about the magic plant.

YES NO The plant grew by 2 inches each day.

YES NO The plant was 8 inches high on Tuesday.

YES NO The plant doubled its height from one day to the next.

YES NO The plant was green.

YES NO The answer is 5 days.

YES NO The plant was 2 inches high on Monday.

****

IF YOU DID ANY OF THESE, WRITE "1" NEXT TO THE SENTENCE YOU DID FIRST, "2" NEXT TO THE SENTENCE YOU DID SECOND, AND "3" NEXT TO THE ONE YOU DID THIRD.

_____ I read the problem again.

_____ I drew a picture.

_____ I decided what information I would use to solve the problem.

_____ I thought about the problem.

_____ I thought about other problems like this one.

_____ I wrote on paper.

_____ I did not do anything.

_____ I did something different. Here's what I did:

_____

_____

****

CIRCLE "YES" NEXT TO THE STATEMENTS THAT ARE CLOSE TO WHAT YOU DID OR THOUGHT ABOUT. CIRCLE "NO" NEXT TO THE STATEMENTS THAT ARE NOT CLOSE TO WHAT YOU DID OR THOUGHT ABOUT.

3. As I was working on the problem,

YES NO I added.

YES NO I saw a pattern and continued it.

YES NO I multiplied.

YES NO I made a chart like this:

M	T	W	TH	F
2	4			

YES NO I figured the answer out in my head.

YES NO I did something different. Here's what I did:

_____

_____

4. When I got an answer,

YES NO I checked to be sure the answer was correct.

YES NO I tried to find more answers.

YES NO I read the problem again.

YES NO I stopped working.

YES NO I tried to think of a problem like this one.

YES NO I don't remember.

YES NO I did something different. Here is what I did:

_____

_____

_____

5. What did you know about your answer?

YES NO I knew my answer was correct.

YES NO I thought my answer was correct, but I was not sure.

YES NO My answer probably was wrong.

YES NO My answer was wrong for sure.

YES NO I did not get an answer.

(PROBLEM 3)

NAME _____ Form AY

Problem 3. Some children are seated at a large round table. They pass around a box of candy containing 25 pieces. Ted takes the first piece. Each child takes one piece of candy as the box is passed around. Ted also gets the last piece of candy and he may have more than the first and last pieces. How many children could be seated about the table?

Answer:

NAME _____ Form AY3

Problem 3 - Questions

FOR QUESTIONS 1 AND 2 CIRCLE "YES" NEXT TO A CORRECT STATEMENT AND "NO" NEXT TO AN INCORRECT STATEMENT.

1. What number of pieces of candy does Ted get?

YES NO Only the first piece of candy.

YES NO The first and last piece of candy.

YES NO Five pieces.

YES NO At least 2 and maybe more pieces of candy.

YES NO I do not remember how many pieces of candy.

2. The problem asks for

YES NO The number of pieces of candy Ted gets.

YES NO The number of pieces of candy that are passed out.

YES NO The number of children who could be seated around the table.

YES NO The number of children who got one piece of candy.

YES NO The number of pieces of candy each child gets.

****

IF YOU DID ANY OF THESE WRITE "1" NEXT TO THE SENTENCE YOU DID FIRST, "2" NEXT TO THE SENTENCE YOU DID SECOND, AND "3" NEXT TO THE ONE YOU DID THIRD.

_____ I read the problem again.

_____ I drew a picture.

_____ I decided what information I would use to solve the problem.

_____ I thought about the problem.

_____ I thought about other problems like this one.

_____ I wrote on paper.

_____ I did not do anything.

_____ I did something different. Here is what I did:

_____

_____

_____

****

CIRCLE "YES" NEXT TO THE STATEMENTS THAT ARE CLOSE TO WHAT YOU DID OR THOUGHT ABOUT. CIRCLE "NO" NEXT TO THE STATEMENTS THAT ARE NOT CLOSE TO WHAT YOU DID OR THOUGHT ABOUT.

4. What were your ideas about the problem?

YES NO If Ted gets the first and last piece, then 23 pieces are left to pass out.

YES NO There is more than one answer.

YES NO The key to the problem is the numbers that divide into 24.

YES NO The only way to work this problem is to draw a picture.

YES NO I could guess the number of children and then see how many pieces are left after passing the box around.

YES NO Whatever answer I give could be right.

****

5. What did you do to get the answer?

YES NO I guessed the answer.

YES NO I figured it out with numbers.

YES NO I drew a picture.

YES NO The answer popped into my head.

YES NO I did not get an answer.

YES NO I did nothing.

6. What did you know about the answer?

YES NO There only was one correct answer.

YES NO There were more than one correct answer.

YES NO There were 7 correct answers.

YES NO There was no answer to this problem.

****

7. What did you do when you got an answer?

YES NO I checked to be sure the answer was correct.

YES NO I tried to find more answers.

YES NO I read the problem again.

YES NO I stopped working.

YES NO I tried to think of a new problem like this one.

YES NO I don't remember.

YES NO I did something different. Here is what I did:

_____

_____

8. What did you know about your answer?

YES NO My answer was correct.

YES NO My answer was correct, but I was not sure.

YES NO My answer probably was wrong.

YES NO My answer was wrong for sure.

YES NO I knew I did not get an answer.

(PROBLEM 1)

NAME _____ Form AW

Problem 1. What are the ways that 10 pennies can be put into 4 piles so that each pile has a different number of pennies?

Answer:

NAME _____ Form AW1

Problem 1 - Questions

FOR QUESTIONS 1, 2, AND 3 CIRCLE THE LETTER NEXT TO YOUR ANSWER.

1. How many pennies were there?

   A. 3

   B. 4

   C. 7

   D. 10

2. How many piles were you asked to make?

   A. 2

   B. 3

   C. 4

   D. 10

3. The problem asked you to make

   A. All the piles different.

   B. Two piles the same and the rest different.

   C. Three piles the same and the rest different.

   D. All the piles the same.

****

IF YOU DID ANY OF THESE, WRITE "1" NEXT TO THE SENTENCE YOU DID FIRST, "2" NEXT TO THE SENTENCE YOU DID SECOND, AND "3" NEXT TO THE ONE YOU DID THIRD.

_____ I read the problem again.

_____ I drew a picture.

_____ I decided what information I would use to solve the problem.

_____ I thought about the problem.

_____ I thought about other problems like this one.

_____ I wrote on paper.

_____ I did not do anything.

_____ I did something different. Here is what I did:

_____

_____

****

FOR QUESTIONS 5, 6, 7, 8, AND 9 CIRCLE THE LETTER NEXT TO YOUR ANSWERS.

5. When I started working on this problem,

   A. I started with a pile with five pennies.

   B. I started with a pile with one penny.

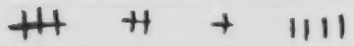
   C. I started with a pile as big as my lucky number.

   D. I started with a pile with _____ pennies.
   (put in the number you started with)

****

6. Here is what some other children wrote down when they did this problem. Which is most like what you did?

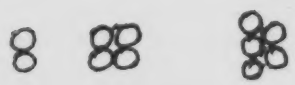
A. Ten marks divided into groups



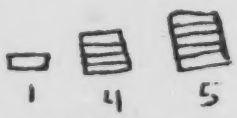
B. Some addition problems like

$$\begin{array}{r} 5 \\ 3 \\ 1 \\ \underline{1} \end{array} \qquad \begin{array}{r} 1 \\ 4 \\ 3 \\ \underline{2} \end{array}$$

C. Some groups of pennies like



D. Some stacks of pennies like



E. I did it a different way. Here is what I did:

_____

_____

7. As I worked this problem

   A. I got an answer that had too many piles.

   B. I found a way to work the problem but it had too many pennies.

   C. I added wrong.

   D. I found an answer with not enough piles.

   E. I got an answer with enough piles but not enough pennies.

   F. I got confused.

8. To get the answer,

   A. I checked to be sure the answer was correct.

   B. I tried to find more answers.

   C. I read the problem again.

   D. I stopped working.

   E. I tried to think of a problem like this one.

   F. I did something different. Here is what I did:

   _____

   _____

9. When I got my answer,

   A. I knew my answer was correct.

   B. I thought my answer was correct, but I was not sure.

   C. I knew my answer was probably wrong.

   D. I knew my answer was wrong for sure.

   E. I did not get an answer.

(PROBLEM 2)

NAME _____ Form AW

Problem 2. On Monday a magic plant is 2 inches high. On Tuesday the plant doubles its height and is 4 inches high. Each day the plant doubles its height from the day before. How high will the plant be on Friday?

Answer:

NAME _____ Form AW2

Problem 2 - Questions

FOR QUESTIONS 1 AND 2 CIRCLE THE LETTER NEXT TO YOUR ANSWER.

1. On the first day the magic plant was

   A. 6 inches high

   B. 4 inches high

   C. 3 inches high

   D. 2 inches high

2. How did the height of the plant change from one day to the next?

   A. It was 2 inches higher.

   B. It was twice as high.

   C. You can't tell without knowing which day.

****

IF YOU DID ANY OF THESE, WRITE "1" NEXT TO THE SENTENCE YOU DID FIRST, "2" NEXT TO THE SENTENCE YOU DID SECOND, AND "3" NEXT TO THE ONE YOU DID THIRD.

_____ I read the problem again.

_____ I drew a picture.

_____ I decided what information I would use to solve the problem.

_____ I thought about the problem.

_____ I thought about other problems like this one.

_____ I wrote on paper.

_____ I did not do anything.

_____ I did something different. Here's what I did:

_____

_____

****

FOR QUESTIONS 4, 5, 6, AND 7, CIRCLE THE LETTER NEXT TO YOUR ANSWER.

4. When I was trying to solve the problem,

   A. I saw a pattern and continued it.

   B. I made a chart like this:

M	T	W	TH	F
2	4			

   C. I figured out the answer in my head.

   D. I did something different. Here's what I did:

_____

_____

5. To find the answer,

   A. I added.

   B. I multiplied.

   C. I subtracted.

   D. I divided.

****

6. When I got an answer,

   A. I checked to be sure the answer was correct.

   B. I tried to find more answers.

   C. I read the problem again.

   D. I stopped working.

   E. I tried to think of a problem like this one.

   F. I did something different. Here is what I did:

   _____

   _____

7. When I got my answer,

   A. I knew my answer was correct.

   B. I thought my answer was correct, but I was not sure.

   C. I knew my answer was probably wrong.

   D. I knew my answer was wrong for sure.

   E. I did not get an answer.

(PROBLEM 3)

NAME _____ Form AW

Problem 3. Some children are seated at a large round table. They pass around a box of candy containing 25 pieces. Ted takes the first piece. Each child takes one piece of candy as the box is passed around. Ted also gets the last piece of candy, and he may have more than the first and last pieces. How many children could be seated around the table?

Answer:

NAME _____ Form AW3

Problem 3 - Questions

FOR QUESTIONS 1 AND 2 CIRCLE THE LETTER NEXT TO YOUR ANSWER.

1. Which best tells how many pieces of candy Ted gets?

   A. Just the first piece.

   B. The first and last piece.

   C. Five pieces.

   D. At least 2 and maybe more pieces.

   E. I do not remember how many pieces of candy.

2. The problem asks for

   A. The number of pieces of candy Ted gets.

   B. The number of pieces of candy that are passed out.

   C. The number of children who could be seated around the table.

   D. The number of children who got one piece of candy.

   E. The number of pieces of candy each child gets.

****

IF YOU DID ANY OF THESE, WRITE "1" NEXT TO THE SENTENCE YOU DID FIRST, "2" NEXT TO THE SENTENCE YOU DID SECOND, AND "3" NEXT TO THE ONE YOU DID THIRD.

_____ I read the problem again.

_____ I drew a picture.

_____ I decided what information I would use to solve the problem.

_____ I thought about the problem.

_____ I thought about other problems like this one.

_____ I wrote on paper.

_____ I did not do anything.

_____ I did something different. Here is what I did:

_____

_____

_____

****

FOR QUESTIONS 4, 5, 6, 7, AND 8 CIRCLE THE LETTER NEXT TO YOUR ANSWER.

4. When I worked on this problem,

   A. I thought if Ted gets the first and last piece, then 23 pieces are left to pass out.

   B. I thought there is more than one answer.

   C. I thought the key to the problem is the numbers that divide into 24.

   D. I thought that the only way to work this problem is to draw a picture.

   E. I could guess the number of children and then see how many pieces are left after passing the box around.

   F. Whatever answer I give could be right.

5. To get the answer,

   A. I guessed the answer.

   B. I figured it out with numbers.

   C. I drew a picture.

   D. The answer popped into my head.

   E. I did not get an answer.

   F. I did nothing.

****

6. What did you know about the answer?

   A. There only was one correct answer.

   B. There were more than one correct answers.

   C. There were 7 correct answers.

   D. There was no answer to this problem.

7. When I got an answer,

   A. I checked to be sure the answer was correct.

   B. I tried to find more answers.

   C. I read the problem again.

   D. I stopped working.

   E. I tried to think of a new problem like this one.

   I don't remember.

   G. I did something different. Here is what I did:

   _____

   _____

8. When I got my answer,

   A. I knew I was right.

   B. I knew I could be right.

   C. I knew I probably was wrong.

   D. I knew I was wrong for sure.

   E. I knew I did not get an answer.

(PROBLEM 1)

NAME _____ Form BP

Problem 1. A caterpillar is put into the bottom of a jar that is 8 inches high and 6 inches across. Everyday it crawls up 4 inches. Every night it slips back 2 inches. How many days will it take the caterpillar to reach the top of the jar?

Answer:

NAME _____ Form BP1

Problem 1 - Questions

CIRCLE "YES" NEXT TO A CORRECT STATEMENT AND "NO" NEXT TO AN INCORRECT STATEMENT.

1. The information given that helped me solve the problem includes.

YES NO The jar is 6 inches across.

YES NO The caterpillar goes up 4 inches everyday.

YES NO The jar is 8 inches high.

YES NO The caterpillar goes down 2 inches every night.

2. I think the problem asked

YES NO How many days it took the caterpillar to first reach the top of the jar.

YES NO What day of the week the caterpillar reached the top of the jar.

YES NO How many days it took the caterpillar to end up at the top of the jar.

YES NO What day the caterpillar got out of the jar.

****

CIRCLE "YES" NEXT TO THE STATEMENTS THAT ARE CLOSE TO WHAT YOU DID OR THOUGHT. CIRCLE "NO" TO THE STATEMENTS THAT ARE NOT CLOSE TO WHAT YOU DID OR THOUGHT.

4. When I did the problem, I thought about

YES NO The caterpillar and how it would go up.

YES NO A chart like

Day 1	up to 4	down to 2	end at 2
Day 2	up to 6	down to 4	end at 4

YES NO A number sentence like: 2 inches x ☐ = 8 inches.

YES NO A number sentence like: 0 + 4 = 4 - 2 = 2 + 4 = 6 - 2 = 4
1 2

YES NO I thought about something different. Here's what I thought about:

_____

_____

_____

****

5. To get the answer,

YES NO I figured it out in my head.

YES NO I figured it out on paper.

YES NO I really didn't figure it out. The answer just came to me.

YES NO I figured it out my own way. Here's what I did:

_____

_____

_____

6. What did you do when you got an answer?

YES NO I checked to be sure the answer was correct.

YES NO I tried to find more answers.

YES NO I read the problem again.

YES NO I stopped working.

YES NO I tried to think of a new problem like this one.

YES NO I don't remember.

YES NO I did something different. Here is what I did:

_____

_____

_____

****

7. What did you know about your answer?

YES NO I knew my answer was correct.

YES NO I thought my answer was correct but I was not sure.

YES NO My answer was probably wrong.

YES NO My answer was wrong for sure.

YES NO There was no way to find the answer.

(PROBLEM 2)

NAME _____ Form BP

Problem 2. Lisa had $1.00 to spend at the store. Apples cost 12 cents apiece. Oranges cost 10 cents apiece. How many apples and oranges can Lisa buy?

Answer:

NAME _____ Form BP2

Problem 2 - Questions

CIRCLE "YES" NEXT TO A CORRECT STATEMENT AND "NO" NEXT TO AN INCORRECT STATEMENT.

1. To work this problem

YES	NO	I had to spend a whole dollar.
YES	NO	I could come close to spending the whole dollar.
YES	NO	I could spend as much as I wanted as long as it wasn't more than a dollar.
YES	NO	I had to spend the same thing on apples and on oranges.

2. The problem said to

YES	NO	Buy apples and oranges.
YES	NO	Buy apples only.
YES	NO	Buy oranges only.
YES	NO	Buy whichever I liked best.

****

IF YOU DID ANY OF THESE, WRITE "1" NEXT TO THE SENTENCE YOU DID FIRST, "2" NEXT TO THE SENTENCE YOU DID SECOND, AND "3" NEXT TO THE ONE YOU DID THIRD.

_____ I read the problem again.

_____ I drew a picture.

_____ I decided what information I would use to solve the problem.

_____ I thought about the problem.

_____ I thought about other problems like this one.

_____ I wrote on paper.

_____ I did not do anything.

_____ I did something different. Here's what I did:

_____

_____

****

CIRCLE "YES" NEXT TO THE STATEMENTS THAT ARE CLOSE TO WHAT YOU DID OR THOUGHT. CIRCLE "NO" NEXT TO THE STATEMENTS THAT ARE NOT CLOSE TO WHAT YOU DID OR THOUGHT.

4. To do the problem,

YES NO I guessed the number of oranges and then tried to find the number of apples.

YES NO I found the cost of apples first.

YES NO I found the cost of both an apple and an orange.

YES NO I made a chart for different numbers of apples and oranges.

YES NO I did something different. Here's what I did:

_____

_____

_____

5. What did you do when you got an answer?

YES NO I checked to be sure the answer was correct.

YES NO I tried to find more answers.

YES NO I read the problem again.

YES NO I stopped working.

YES NO I tried to think of a problem like this one.

YES NO I don't remember.

YES NO I did something different. Here is what I did:

_____

****

6. What did you know about your answer?

YES NO I knew my answer was correct.

YES NO I thought my answer was correct, but I was not sure.

YES NO My answer was probably wrong.

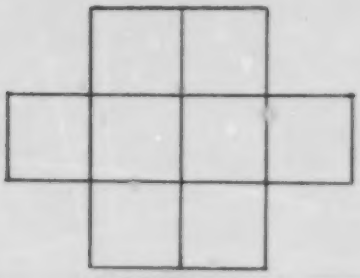
YES NO My answer was wrong for sure.

YES NO There was no way to find an answer.

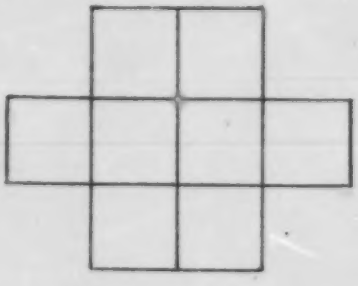
(PROBLEM 3)

NAME _____ Form BP

Problem 3. Use each number from 1 to 8 once to fill in the small squares so that no two numbers that follow in order (such as 4 and 5) are in squares that touch.



Answer:

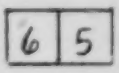


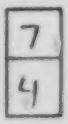
NAME _____ Form BP3

Problem 3 - Questions

CIRCLE "YES" NEXT TO A CORRECT STATEMENT AND "NO" NEXT TO AN INCORRECT STATEMENT.

1. Is this a way to fill in two of the small squares?

YES NO 

YES NO 

YES NO

****

IF YOU DID ANY OF THESE, WRITE "1" NEXT TO THE SENTENCE YOU DID FIRST, "2" NEXT TO THE SENTENCE YOU DID SECOND, AND "3" NEXT TO THE ONE YOU DID THIRD.

_____ I read the problem again.

_____ I drew a picture.

_____ I decided what information I would use to solve the problem.

_____ I thought about the problem.

_____ I thought about other problems like this one.

_____ I wrote on paper.

_____ I did not do anything.

_____ I did something different. Here's what I did:

_____

_____

****

CIRCLE "YES" NEXT TO THE STATEMENTS THAT ARE CLOSE TO WHAT YOU DID OR THOUGHT ABOUT. CIRCLE "NO" NEXT TO THE STATEMENTS THAT ARE NOT CLOSE TO WHAT YOU DID OR THOUGHT ABOUT.

3. Your ideas to start the problem?

YES NO Start with 1 then filled in 2, 3, 4, 5, 6, 7, and 8 in that order.

YES NO Put 1 and 8 in first.

YES NO Write some numbers down trying to think what to do.

YES NO Skip every other square.

YES NO I don't remember.

YES NO Do something different. Here is what I did:

_____

_____

_____

4. What did you think about when working the problem?

YES NO Is there a rule?

YES NO What would be a good guess?

YES NO Is there a system?

YES NO How do the numbers differ?

YES NO About another problem like this one that I have done before.

YES NO I thought about nothing.

YES NO I don't remember.

YES NO I thought about something different. Here is what I thought about:

_____

_____

5. What did you find out about this problem?

YES NO The 8 should go in the middle square.

YES NO The 8 can go in any square.

YES NO The 1 can go in any square.

YES NO Numbers one apart cannot go in the side squares.

YES NO Odd numbers have to touch.

YES NO I found out something different. Here is what I learned:

_____

6. What did you do when you got an answer?

YES NO I checked the numbers to be sure the answer was correct.

YES NO I tried to find more answers.

YES NO I read the problem again.

YES NO I stopped working.

YES NO I tried to think of a new problem like this one.

YES NO I don't remember.

YES NO I did something different. Here is what I did:

_____

_____

7. What did you know about your answer?

YES NO I knew my answer was correct.

YES NO I thought my answer was correct, but I was not sure.

YES NO My answer probably was wrong.

YES NO My answer was wrong for sure.

YES NO There probably are more ways to work the problem.

YES NO There was no way to find an answer.

(PROBLEM 1)

NAME _____ Form BG

Problem 1. A caterpillar is put into the bottom of a jar that is 8 inches high and 6 inches across. Every day it crawls up 4 inches. Every night it slips back 2 inches. How many days will it take the caterpillar to reach the top of the jar?

Answer:

NAME _____ Form BG1

Problem 1 - Questions

FOR QUESTIONS 1 AND 2 CIRCLE THE LETTER NEXT TO YOUR ANSWER.

1. In this problem the jar was

   A. 10 inches high

   B. 8 inches high

   C. 6 inches high

   D. 4 inches high

2. This problem asked you to find

   A. The day of the week the caterpillar reached the top of the jar.

   B. The number of days it took for the caterpillar to end up at the top of the jar.

   C. The number of days it took for the caterpillar to first reach the top of the jar.

   D. Here's what I think the problem asked for:

   _____

   _____

****

IF YOU DID ANY OF THESE, WRITE "1" NEXT TO THE SENTENCE YOU DID FIRST, "2" NEXT TO THE SENTENCE YOU DID SECOND, AND "3" NEXT TO THE ONE YOU DID THIRD.

_____ I read the problem again.

_____ I drew a picture.

_____ I decided what information I would use to solve the problem.

_____ I thought about the problem.

_____ I thought about other problems like this one.

_____ I wrote on paper.

_____ I did not do anything.

_____ I did something different. Here is what I did:

_____

_____

****

FOR QUESTIONS 4, 5, 6, AND 7 CIRCLE THE LETTER NEXT TO YOUR ANSWER.

4. Here is what some other children thought about when they did the problem. Which is most like what you thought about?

A. The jar and how the caterpillar would go up.

B. A chart like

Day 1	up to 4	down to 2	end at 2
Day 2	up to 6	down to 4	end at 4

C. A number sentence like

2 inches x ☐ = 8 inches

D. A number sentence like

$$0 + 4 = 4 - 2 = \underset{\substack{| \\ 1}}{2} + 4 = 6 - \underset{\substack{| \\ 2}}{2} = 4$$

E. I did something different like:

_____

_____

5. To get the answer,

   A. I figured it out in my head.

   B. I figured it out on paper.

   C. I didn't really figure it out. The answer just came to me.

   D. I figured it out my own way. Here's how I did it:

   _____

   _____

6. When I got an answer,

   A. I checked to be sure the answer was correct.

   B. I tried to find more answers.

   C. I read the problem again.

   D. I stopped working.

   E. I tried to think of a problem like this one.

   F. I did something different. Here is what I did:

   _____

   _____

7. When I got my answer,

   A. I knew my answer was correct.

   B. I thought my answer was correct, but I was not sure.

   C. I knew my answer was probably wrong.

   D. I knew my answer was wrong for sure.

   E. I did not get an answer.

(PROBLEM 2)

NAME _____ Form BG

Problem 2. Lisa had $1.00 to spend at the store. Apples cost 12¢ a piece. Oranges cost 10¢ a piece. How many apples and oranges can Lisa buy?

Answer:

NAME _____ Form BG2

Problem 2 - Questions

FOR QUESTIONS 1 AND 2 CIRCLE THE LETTER NEXT TO YOUR ANSWER.

1. The problem asked me to

   A. Spend the whole dollar

   B. Come as close as possible to spending the whole dollar

   C. Spend as much as I wanted as long as it wasn't more than a dollar

   D. Spend the same thing on apples and on oranges

2. The problem said to

   A. Buy apples and oranges

   B. Buy apples only

   C. Buy oranges only

   D. Buy whichever I liked best

****

IF YOU DID ANY OF THESE, WRITE "1" NEXT TO THE SENTENCE YOU DID FIRST, "2" NEXT TO THE SENTENCE YOU DID SECOND, AND "3" NEXT TO THE ONE YOU DID THIRD.

_____ I read the problem again.

_____ I drew a picture.

_____ I decided what information I would use to solve the problem.

_____ I thought about the problem.

_____ I thought about problems like this one.

_____ I wrote on paper.

_____ I did not do anything.

_____ I did something different. Here's what I did.

_____

_____

****

FOR QUESTIONS 4, 5, AND 6, CIRCLE THE LETTER NEXT TO YOUR ANSWER.

4. To do the problem,

   A. I guessed the number of oranges and then tried to find the number of apples.

   B. I found the cost of apples first.

   C. I found the cost of both an apple and an orange.

   D. I made a chart for different numbers of apples and oranges.

   E. I did something different. Here's what I did:

   _____

   _____

5. When I got an answer,

   A. I checked to be sure the answer was correct.

   B. I tried to find more answers.

   C. I read the problem again.

   D. I stopped working.

   E. I tried to think of a new problem like this one.

   F. I did something different. Here is what I did:

   _____

   _____

6. When I got my answer

   A. I knew my answer was correct.

   B. I thought my answer was correct, but I was not sure.

   C. I knew my answer was probably wrong.

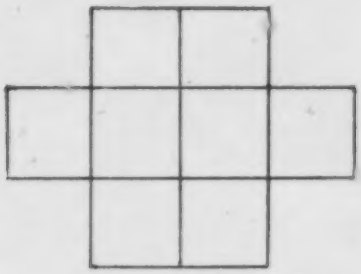
   D. I knew my answer was wrong for sure.

   E. I did not get an answer.

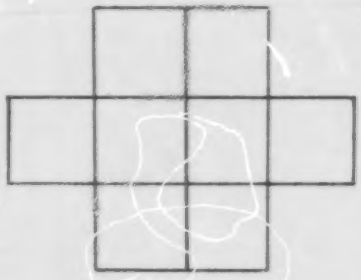
(PROBLEM 3)

NAME _____ Form BG

Problem 3. Use each number from 1 to 8 once to fill in the small squares so that no two numbers that follow in order (such as 4 and 5) are in squares that touch.



Answer:

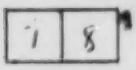


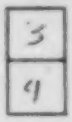
NAME _____ Form BG3

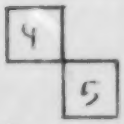
Problem 3 - Questions

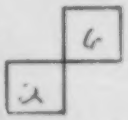
FOR QUESTION 1 CIRCLE THE LETTER NEXT TO YOUR ANSWER.

1. Which is a way that two small squares can be filled?

A. 

C. 

B. 

D. 

****

IF YOU DID ANY OF THESE, WRITE "1" NEXT TO THE SENTENCE YOU DID FIRST, "2" NEXT TO THE SENTENCE YOU DID SECOND, AND "3" NEXT TO THE ONE YOU DID THIRD.

_____ I read the problem again.

_____ I drew a picture.

_____ I decided what information I would use to solve the problem.

_____ I thought about the problem.

_____ I thought about other problems like this one.

_____ I wrote on paper.

_____ I did not do anything.

_____ I did something different. Here is what I did:

_____

_____

_____

****

FOR QUESTIONS 3, 4, 5, 6, AND 7, CIRCLE THE LETTER NEXT TO YOUR ANSWER.

3. What did you think about when you did this problem?

   A. How to find a rule.

   B. What would be a good guess.

   C Is there a system.

   D. About each number and how the numbers differed.

   E. Another problem like this one that I have done before.

   F. Nothing.

   G. I thought about something different. Here is what I did:

   _____

   _____

4. I learned from doing this problem that the 8 should go in one of the

   A. top squares.

   B. bottom squares.

   C. middle squares.

   D. side squares.

   E. It does not matter which square it is in.

5. A rule that I learned was that

   A. numbers one apart cannot go in the side squares.

   B. 1 has to go in a middle square.

   C. odd numbers have to touch.

   D. I did not find a rule.

   E. I found a different rule. Here is what I found:

   _____

   _____

6. When I got an answer,

   A. I checked the numbers to be sure the answer was correct.

   B. I tried to find more answers.

   C. I read the problem again.

   D. I stopped working.

   E. I tried to think of a problem like this one.

   F. I did something different. Here is what I did:

   _____

   _____

   _____

7. When I got my answer,

   A. I knew my answer was correct.

   B. I thought my answer was correct, but I was not sure.

   C. I knew my answer was probably wrong.

   D. I knew my answer was wrong for sure.

   E. I did not get an answer.

TECHNICAL REPORT V: PROCESS EVALUATION

APPENDIX C: Second Instrument

NAME _____ TEACHER _____

Problem A caterpillar is put on the bottom of a jar that is 8 inches high and 7 inches across. The jar has a lid with holes in it. Every day the caterpillar crawls up 4 inches. Every night it slips back 2 inches. How many days will it take for the caterpillar to touch the lid of the jar?

WORK HERE

ANSWER HERE

NAME _____

Caterpillar Problem - Questions

1. Check (✓) the information below that helped you solve the problem. (Check one, more than one, or none.)

_____ The jar is 7 inches across.

_____ The caterpillar goes up 4 inches every day.

_____ The jar is 8 inches high.

_____ The caterpillar goes down 2 inches every night.

_____ The jar has a lid.

2. Check (✓) what you think the problem asked.

_____ How many days did it take the caterpillar to touch the lid of the jar?

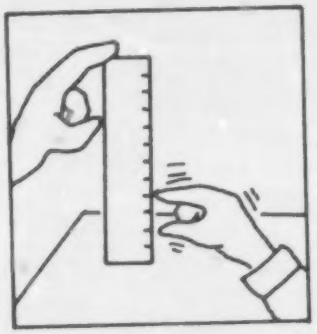
_____ What day of the week did the caterpillar reach the top of the jar?

_____ What day of the week did the caterpillar get out of the jar?

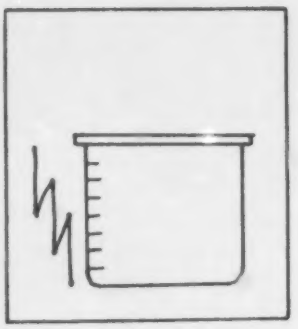
_____ How many days did it take the caterpillar to get out of the jar?

LOOK AT EACH OF THE BOXES AND THEN ANSWER THE QUESTIONS BELOW.

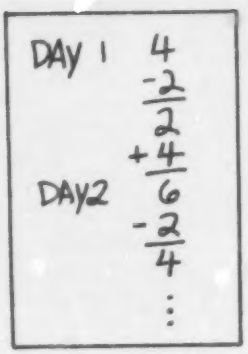
A.



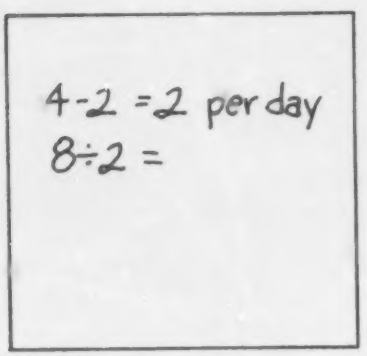
B.



C.



D.



E.

Which of the above is like what you thought about?

A B C D E
(Circle one or more.)

Which of the above is like what you did?

A B C D E
(Circle one or more.)

Which of the above is like what you did first?

A B C D E
(Circle one.)

Which of the above is like what you did to get an answer?

A B C D E
(Circle one or more.)

If you circled E above, show us what you did in this box.

WHAT SOME PEOPLE DO WHEN THEY SOLVE PROBLEMS IS LISTED BELOW. MAKE A CHECK (✓) NEXT TO EACH ONE YOU DID WHILE WORKING THE CATERPILLAR PROBLEM.

_____ Made a drawing

_____ Looked for a pattern

_____ Thought about a problem like this one that I have solved before

_____ Tried a number of days that the caterpillar could have taken and then checked to see if the number was correct

_____ Made a list of numbers

_____ Used a number sentence

_____ Made a table

_____ I did something different. Here is what I did.

_____

_____

_____

_____

_____

PUT A CHECK (✓) BESIDE WHAT YOU DID AS SOON AS YOU READ THE PROBLEM.
(You may check more than one.)

_____ I thought a while before I wrote anything down.

_____ I knew the answer right away.

_____ I knew what to do right away.

_____ I drew a picture to help me figure out what to do.

_____ I drew a picture to use in getting an answer.

_____ I wrote down some numbers to help me figure out what to do.

_____ I wrote down some numbers to use in getting an answer.

_____ I used all the numbers in the problem.

_____ I did not do any of these. What I did do when I first read the problem was

_____

_____

_____

I worked the caterpillar problem
(check (✓) one.)

- ☐ one way.
- ☐ more than one way.

The first time I tried this problem I
(check (✓) one or more.)

- ☐ knew I was right.
- ☐ did everything I knew how to do.
- ☐ checked and it was right.
- ☐ had done all I wanted to do.
- ☐ had done all there was to do.
- ☐ did not do any of these things.

I tried a second way because I
(check (✓) one or more.)

- ☐ knew the first way was wrong.
- ☐ wanted to see if another way would work.
- ☐ checked and saw the first way was wrong.
- ☐ wasn't sure if the first way was right.
- ☐ used a second way to check the first way.
- ☐ I tried a second way for another reason.

After I got an answer I (mark (✓) one)

☐ did not check the answer.

Now mark (✓) below why you did not check your answer.

I did not check my answer because I

☐ knew it was right.

☐ did not know what to do.

☐ had done all I wanted.

☐ I had a different reason for not checking my answer.

☐ checked the answer.

Now mark (✓) below how you checked you answer.

I checked my answer by

☐ checking my work.

☐ working the problem again the same way.

☐ working the problem again a different way.

☐ reading the problem again.

☐ acting it out.

☐ doing something different than these.

TECHNICAL REPORT V: PROCESS EVALUATION

APPENDIX D: Student Responses to Second Instrument and Transcripts of Interviews

NAME Susan Weber TEACHER Mr. Marsh

Problem A caterpillar is put on the bottom of a jar that is 8 inches high and 7 inches across. The jar has a lid with holes in it. Every day the caterpillar crawls up 4 inches. Every night it slips back 2 inches. How many days will it take for the caterpillar to touch the lid of the jar?

WORK HERE

4 2

4 2 2

4 2 2

ANSWER HERE

3

NAME Susan

Caterpillar Problem - Questions

1. Check (✓) the information below that helped you solve the problem. (Check one, more than one, or none.)

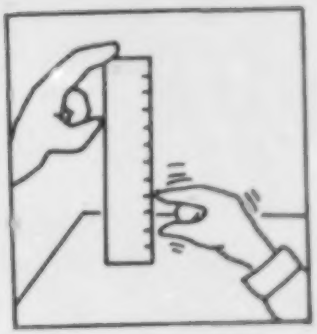
_____	The jar is 7 inches across.
✓	The caterpillar goes up 4 inches every day.
✓	The jar is 8 inches high.
✓	The caterpillar goes down 2 inches every night.
_____	The jar has a lid.

2. Check (✓) what you think the problem asked.

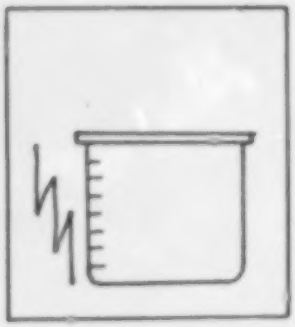
✓	How many days did it take the caterpillar to touch the lid of the jar?
_____	What day of the week did the caterpillar reach the top of the jar?
_____	What day of the week did the caterpillar get out of the jar?
_____	How many days did it take the caterpillar to get out of the jar?

LOOK AT EACH OF THE BOXES AND THEN ANSWER THE QUESTIONS BELOW.

A.



B.



C.

DAY 1 $4 - 2 = 2$

DAY 2 $2 + 4 = 6$

$6 - 2 = 4$

⋮

D.

$4 - 2 = 2$ per day

$8 \div 2 =$

E.

Something Else

Which of the above is like what you thought about?

A B C D (E)
(Circle one or more.)

Which of the above is like what you did?

A B (C) (D) E
(Circle one or more.)

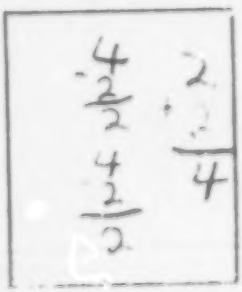
Which of the above is like what you did first?

A B (C) D E
(Circle one.)

Which of the above is like what you did to get an answer?

A B (C) (D) E
(Circle one or more.)

If you circled E above, show us what you did in this box.



WHAT SOME PEOPLE DO WHEN THEY SOLVE PROBLEMS IS LISTED BELOW. MAKE A CHECK (✓) NEXT TO EACH ONE YOU DID WHILE WORKING THE CATERPILLAR PROBLEM.

_____ Made a drawing

_____ Looked for a pattern

_____✓ Thought about a problem like this one that I have solved before

_____ Tried a number of days that the caterpillar could have taken and then checked to see if the number was correct

_____ Made a list of numbers

_____ Used a number sentence

_____ Made a table

_____ I did something different. Here is what I did.

_____

_____

_____

_____

_____

PUT A CHECK (✓) BESIDE WHAT YOU DID AS SOON AS YOU READ THE PROBLEM.
(You may check more than one.)

✓ I thought a while before I wrote anything down.

_____ I knew the answer right away.

_____ I knew what to do right away.

_____ I drew a picture to help me figure out what to do.

_____ I drew a picture to use in getting an answer.

_____ I wrote down some numbers to help me figure out what to do.

_____ I wrote down some numbers to use in getting an answer.

✓ I used all the numbers in the problem.

_____ I did not do any of these. What I did do when I first read the problem was

_____

_____

_____

I worked the caterpillar problem
(check (✓) one.)

- ☐ one way.
- ☐ more than one way.

The first time I tried this problem I
(check (✓) one or more.)

- ☐ knew I was right.
- ☑ did everything I knew how to do.
- ☐ checked and it was right.
- ☐ had done all I wanted to do.
- ☑ had done all there was to do.
- ☐ did not do any of these things.

I tried a second way because I
(check (✓) one or more.)

- ☐ knew the first way was wrong.
- ☐ wanted to see if another way would work.
- ☐ checked and saw the first way was wrong.
- ☐ wasn't sure if the first way was right.
- ☐ used a second way to check the first way.
- ☐ I tried a second way for another reason.

After I got an answer I (mark (✓) one)

☐ did not check the answer.

Now mark (✓) below why you did not check your answer.

I did not check my answer because I

☑ knew it was right.

☐ did not know what to do.

☐ had done all I wanted.

☐ I had a different reason for not checking my answer.

☐ checked the answer.

Now mark (✓) below how you checked you answer.

I checked my answer by

☐ checking my work.

☐ working the problem again the same way.

☐ working the problem again a different way.

☐ reading the problem again.

☐ acting it out.

☐ doing something different than these.

TRANSCRIPT OF INTERVIEW WITH SUSAN WEBER

Susan: Well, if he goes up 4 every night, then it would only take him 2 nights. But he slips back 2 inches, so he goes up 4. It would take him 3.

Interviewer: Tell me more about that.

Susan: See, okay, he goes up 4, he loses 2, and then that's 2. Another time he goes up 4, he loses 2, and that's 2. And then he puts back these two 2's that he fell back, and he crawls that up during that day, and he doesn't have to fall back again. He crawls up the 4 inches that he lost in those two times he fell back. So, it would take him 3 days.

NAME _____ TEACHER _____

Problem A caterpillar is put on the bottom of a jar that is 8 inches high and 7 inches across. The jar has a lid with holes in it. Every day the caterpillar crawls up 4 inches. Every night it slips back 2 inches. How many days will it take for the caterpillar to touch the lid of the jar?

WORK HERE

ANSWER HERE

4

NAME _____

Caterpillar Problem - Questions

1. Check (✓) the information below that helped you solve the problem. (Check one, more than one, or none.)

_____ The jar is 7 inches across.

_✓_ The caterpillar goes up 4 inches every day.

_____ The jar is 8 inches high.

_✓_ The caterpillar goes down 2 inches every night.

_____ The jar has a lid.

2. Check (✓) what you think the problem asked.

_✓_ How many days did it take the caterpillar to touch the lid of the jar?

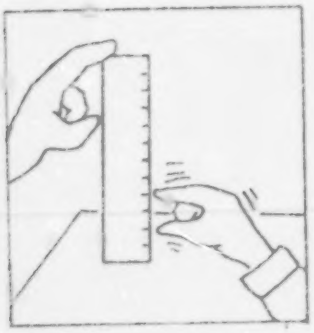
_____ What day of the week did the caterpillar reach the top of the jar?

_____ What day of the week did the caterpillar get out of the jar?

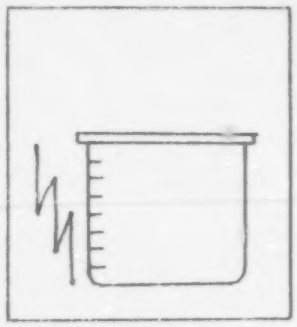
_____ How many days did it take the caterpillar to get out of the jar?

LOOK AT EACH OF THE BOXES AND THEN ANSWER THE QUESTIONS BELOW.

A.



B.



C.

DAY 1 4
$-\frac{2}{2}$
$+\frac{4}{6}$
DAY 2
$-\frac{2}{4}$
⋮

D.

4-2 = 2 per day
8÷2 =

E.

Something Else

Which of the above is like what you thought about?

A B C D E
(Circle one or more.)

Which of the above is like what you did?

A B C D E
(Circle one or more.)

Which of the above is like what you did first?

A B C D E
(Circle one.)

Which of the above is like what you did to get an answer?

A B C D E
(Circle one or more.)

If you circled E above, show us what you did in this box.

WHAT SOME PEOPLE DO WHEN THEY SOLVE PROBLEMS IS LISTED BELOW. MAKE A CHECK (✓) NEXT TO EACH ONE YOU DID WHILE WORKING THE CATERPILLAR PROBLEM.

_____ Made a drawing

_____ Looked for a pattern

_____ Thought about a problem like this one that I have solved before

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_____ Used a number sentence

_____ Made a table

_____ I did something different. Here is what I did.

_____

_____

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I worked the caterpillar problem
(check (✓) one.)

- [x] one way.
- [ ] more than one way.

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(check (✓) one or more.)

- [x] knew I was right.
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I tried a second way because I
(check (✓) one or more.)

- [ ] knew the first way was wrong.
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☐ acting it out.

☑ doing something different than these.

TRANSCRIPT OF INTERVIEW WITH EDDIE FULTZ

Interviewer: What kinds of things did you think about with this problem after you read it?

Eddie: I thought about ... how many days, like I wrote 2, and then I was thinking of a number that would go together with 8, so I wrote 4.

Interviewer: So you tried some different numbers. Did you try 2?

Eddie: Yes, I was thinking about like what number it would be so I tried 2, and that makes 4. I tried 3, that makes 6. And then I tried 4.

Interviewer: And that makes 8. Why were you looking for 2 times something equals 8?

Eddie: Because they said that the bottle is 8 inches. So, if... and it said that it crawled up 2 inches every day, so if I could find something that hangs together.

NAME Emily Hinder TEACHER Mr. Mezr

Problem A caterpillar is put on the bottom of a jar that is 8 inches high and 7 inches across. The jar has a lid with holes in it. Every day the caterpillar crawls up 4 inches. Every night it slips back 2 inches. How many days will it take for the caterpillar to touch the lid of the jar?

WORK HERE

6 day to the caterpillar get to the top

ANSWER HERE

NAME Trudy Hunt

Caterpillar Problem - Questions

1. Check (✓) the information below that helped you solve the problem. (Check one, more than one, or none.)

	The jar is 7 inches across.
✓	The caterpillar goes up 4 inches every day.
	The jar is 8 inches high.
✓	The caterpillar goes down 2 inches every night.
	The jar has a lid.

2. Check (✓) what you think the problem asked.

	How many days did it take the caterpillar to touch the lid of the jar?
	What day of the week did the caterpillar reach the top of the jar?
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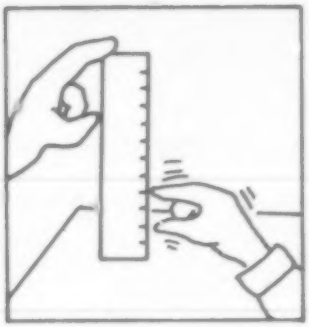

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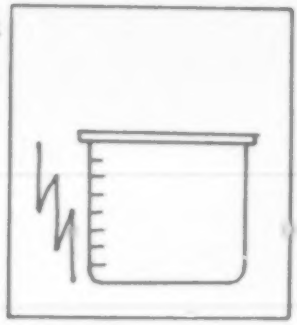

C.

DAY 1 4
-2
2
$+4$
DAY 2 6
-2
4
⋮

D.

4-2 = 2 per day
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A B C (D) E
(Circle one or more.)

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☐ reading the problem again.

☐ acting it out.

☐ doing something different than these.

Trudy: 6 days.

Interviewer: How did you get that?

Trudy: I thought about this bottle. I saw this caterpillar climbing up the jar.

Interviewer: How did you know it was 6?

Trudy: Because he ..., well, he fell down..., he climbed up 4, and he fell back down 2, and I figured up how many more he was going to climb up.

Interviewer: I just want to make sure that I understand how you got 6. You said after one day ...

Trudy: He climbed up 4, and he fell back 2. He climbed up 4, and he fell back 2. He climbed up again, and he fell back 2 like that. He fell all the way back down, and he had to start all over again and to get back up to 8.